

Rec'd PCT/PTO 10 SEP 2004

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
25 September 2003 (25.09.2003)

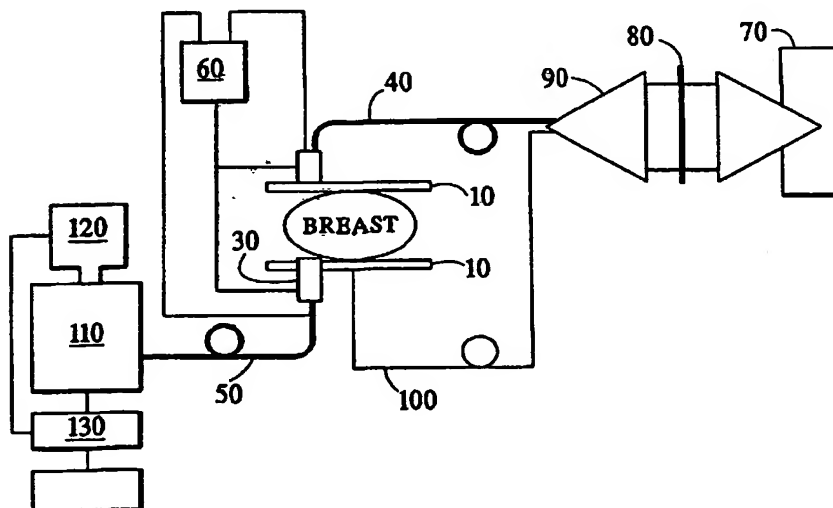
PCT

(10) International Publication Number  
**WO 03/077750 A1**

- (51) International Patent Classification<sup>7</sup>: **A61B 5/00**
- (21) International Application Number: **PCT/US03/07766**
- (22) International Filing Date: **13 March 2003 (13.03.2003)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:  
60/364,239 13 March 2002 (13.03.2002) **US**
- (71) Applicant (for all designated States except US): **TUFTS UNIVERSITY [US/US]; 136 Harrison Avenue, Boston, MA 02111 (US).**
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **FANTINI, Sergio [IT/US]; 6 Dean Road, Winchester, MA 01890 (US).**
- (74) Agent: **FASSE, Peter, J.; Fish & Richardson P.C., 225 Franklin Street, Boston, MA 02110 (US).**
- (81) Designated States (national): **AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.**
- (84) Designated States (regional): **ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).**
- Published:  
— with international search report  
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

(54) Title: **OPTICAL IMAGING AND OXIMETRY OF TISSUE**



(57) Abstract: Systems and methods are disclosed for detecting at least one region of a sample having an absorption level different from a background level of absorption in the sample by obtaining thicknesses of the sample and intensities of light transmitted through the sample at a plurality of locations. The system includes glass plates (10) for compressing the tissue, distance sensors (20, 30), illuminations fibers (40) connected to a light source (70), and collection fibers (50) connected to spectrograph (110). Spatial second derivatives are calculated from products of the thicknesses of the sample and the intensities of the transmitted light for the locations. The data points are compared to detect the region of the sample having an absorption level different from the background level of absorption within the sample. The new systems and method can be used to optically image, detect, and characterize tissue, lesions, such as cancer.

WO 03/077750 A1

WO 03/077750 A1



---

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/07766

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A 61B 5/00  
US CL : 600/322,473,476

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 600/322,473,476,323,309,310; 356/39,41

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
EPO,JPO,Derwent,Google,Medline: search terms: light, imaging, second spatial derivative, tissue

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Hanson, Kenneth M. Optical tomography: seeing inside the body. A presentation available under <a href="http://home.lanl.gov/kmh">http://home.lanl.gov/kmh</a> , slides 13-17	1-11,14-24,42-48
A	US 5,839,141 A (Makram-Ebeid et al.)03 November 1998 (03.11.1998), column 4, line 30 to column column 6, line 59	1-11,14-24,42-48
A	US 5,285,783 A (Secker) 15 February 1994 (15.02.1994), column 3, lines 11-49	12-13,25-41
A	US 6,226,540 B1 (Bernreuter)01 May 2001 (01.05.2001), column 2, line 15 to column 3, line 5	12-13,25-41

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

06 June 2003 (06.06.2003)

Date of mailing of the international search report

**05 AUG 2003**

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Facsimile No. (703)305-3230

Authorized officer

Max Hindenburg

Telephone No. 703-308-3130